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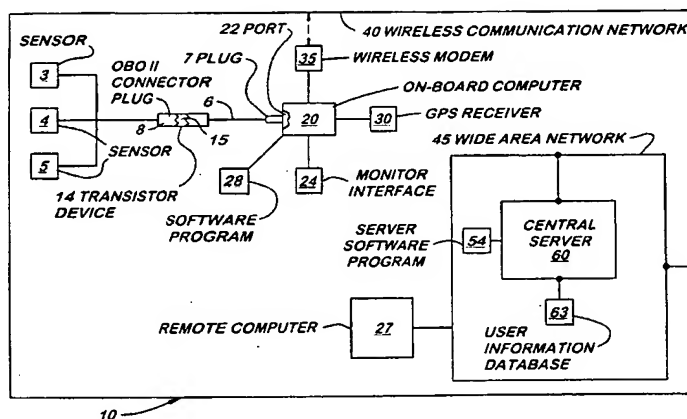
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(54) Title: SYSTEM FOR TRANSMITTING AND DISPLAYING MULTIPLE MOTOR VEHICLE INFORMATION



(57) **Abstract:** A system (10) for transmitting, collecting and displaying diagnostic and operational information from one or more motor vehicles to a central server (60) connected to a wide area network (45). The system (10) is designed to be used with an existing on-board diagnostic system found in most motor vehicles manufactured today. The system (10) includes a translator device (14) capable of translating the codes from an on-board diagnostic connector (8) into computer readable file such as ASCII files. The translator device (14) may be connected to an on-board computer (20) that includes a wireless modem (35) capable of connecting to a wireless communication network (40) and eventually to a wide area network (45). A central server (60) is connected to the wide area network (45) which receives and stores information from the on-board computer (20). Authorized users may connect to central server (60) via the wide area network (60) and request information therefrom regarding selected motor vehicles. All of the information may be presented in a single interface.

5 **TITLE: SYSTEM FOR TRANSMITTING AND DISPLAYING
MULTIPLE, MOTOR VEHICLE INFORMATION**

TECHNICAL FIELD

10 This invention relates to methods of presenting multiple, mobile wireless communications network service information, and more particularly, to systems for transmitting and displaying multiple motor vehicle information.

BACKGROUND ART

15 On-board computers coupled to a wireless communications network service are now available that enable manufacturers of motor vehicles to obtain useful information regarding the motor vehicle. Typically, these on-board computers are electrically connected to sensors located in various systems in the motor vehicle that instantaneously report the status or condition of the system. Manufacturers of motor vehicles can connect to the on-board computer via the mobile, wireless
20 communication network to obtain information from the motor vehicle anywhere within the region covered by the wireless communication network.

 Recently, it has been reported that on-board computers can now be used by motor vehicle operators to download and upload information from a central server connected to a wide area network such as the World Wide Web via the mobile,
25 wireless communications network. Using the on-board computer, an operator can now obtain e-mail messages or other important information from any other servers connected to the wide area network.

 Many motor vehicle drivers own motor vehicles manufactured by different manufactures. Unfortunately, no standard computer program has been developed
30 which can interact with all on-board computers used in every motor vehicle. This creates a large burden for the operator of multiple motor vehicles to understand and learn to operate every computer and program.

 On-board diagnostic systems are used today in most cars and light trucks. To meet federal EPA emission standards implemented in the 1970's, motor vehicle
35 manufacturers started using electronic devices to control engine functions such as fuel feed, ignition, and to diagnose engine problems.

 Initially, motor vehicle manufacturers had their own systems which were not

5 compatible. In 1988, the Society of Automotive Engineers (SAE) set standards which included a standard connector plug and a set of diagnostic test signals that dealer's used when adjusting or repairing the motor vehicle. Although motor vehicle manufacturers may used a uniform set of test signals, the meaning of these test signals is proprietary. The standard connector plug and set of test signals, today, is known
10 collectively as OBD-II which applies to all cars and light trucks built after January 1, 1996. It is anticipated that new on-board diagnostic connectors (i.e. OBD-III) will be developed in the future.

Translator devices, also known as diagnostic scanners, are available that connect to the OBD-II connector plug and translate the diagnostic test signals into
15 ASCII files capable of being used by a personal computer. One translator device, known as AUTOTAP, is available from B&B Electronics Manufacturing Company, of Ottawa, IL. Using this device, independent mechanics are able to connect to the OBD-II connector plug and obtain factory diagnostic service code information. What is needed is a system for operators of motor vehicles to easily obtaining motor
20 vehicle diagnostic and operating information and store this information in a location for later retrieval.

What is also needed is such a system that enables operators to obtain information remotely for a plurality of motor vehicles and then present this information in a concise manner on a single interface.

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DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide a system for collecting and transmitting diagnostic and operation motor vehicle information to a central computer for real time or later retrieval.

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It is another object of the present invention to provide such a system that collects and transmits motor vehicle information from a plurality of motor vehicles in remote locations and collects the information on a central server.

It is a further object of the present invention to provide such a system that enables the information to be presented in a single interface.

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These objects and other objects are met by a system designed to be used with motor vehicles that use sensors and an on-board diagnostic system, such as OBD-II, that enables users to review real time and historical diagnostic and performance

5 information data for one motor vehicle or a plurality of motor vehicles. The system includes the use of a translating means that connects to the motor vehicle's on-board diagnostic system. In one embodiment, the translating means is a separate translator device designed specifically to connect to a commonly used OBD-II connector plug. The translator device includes a translator program capable of translating the
10 proprietary diagnostic test signals into diagnostic service codes presented in a standard computer language, such as ASCII files, to be used by an electronic device, hereinafter called an on-board computer.

The on-board computer is connected to a wireless communication means that continuously or intermittently transmits the ASCII files to a central network server
15 connected to a wide area network, such as the INTERNET. The central network server collects the ASCII text files in a user database file. Authorized users, such as the owner of the motor vehicle or representatives of the motor vehicle manufacturer may connect to the central network server and receive real time data or historical information from the user's database file.

20 An important aspect of the system is that information from multiple motor vehicles may be collected and transmitted to the central server for retrieval by authorized users. A second important aspect is that the system may be used with all motor vehicles that use EPA-mandated diagnostic codes, translating manufacturer's proprietary diagnostic service codes, and provides real time performance data. A
25 third important aspect is that operators can obtain this information anywhere they have access to the wide area network and have it presented in a single interface.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic of the system showing the relationship between the
30 different motor vehicle manufacturers, the central server, the wide area network, a plurality of different motor vehicles owned by one operator with a motor vehicle computer coupled to various motor vehicle systems, a translator device, an add-on computer with an display interface, and a remote computer with a display interface.

Fig. 2 is a front plan view of a monitor presenting information collected for a
35 plurality of motor vehicles

BEST MODE FOR CARRYING OUT THE INVENTION

Disclosed herein is a system 10 of transmitting and displaying real time and historical multiple motor vehicle information over a central server 60 connected to a wide area network 45. Authorized users may then connect to the central server 60 to connect the real time or historical information on selected motor vehicles. The system 10 is especially beneficial to operators of multiple motor vehicles, each having factory-installed sensors or computer module which enables the operators to conveniently connect to the wide area network 45 and receive the stored uploaded information for each motor vehicle. The information for all of the motor vehicles controlled by the operation may be conveniently present on one monitor interface as shown in Fig. 2.

The system 10 uses a translator device 14, also known as diagnostic scanners, capable of connected to an existing OBD-II connector plug 8 and translate the diagnostic test signals into ASCII files capable of being used by a personal computer. One translator device 14, known as AUTOTAP, is available from B&B Electronics Manufacturing Company, of Ottawa, IL. Each motor vehicle that uses the system 10 must have a translator device 14 that connects to the OBD-II plug connector 8. The translator device 14 includes an output cable 6 and plug 7 that connects to a RS 232 (COM) port 22 on the on-board computer 20. The translator device 14 includes a microprocessor and custom circuitry (not shown) that translate the signals from the motor vehicle's sensors 3-5 or computer module 7 to ASCII text file capable to being used by the on-board computer 20.

The on-board computer 20 may be a hand-held device, a lap-top computer, or a PDA. Each on-board computer 20 is coupled to a wireless communication means, such as a wireless modem 35, which transmits the diagnostic and performance information and other useful information over a wireless communication network 40 to the central server 60 connected to a wide area network 45. The central server 60 collects the uploaded information from an on-board computer 20 located in one motor vehicle or in a plurality of motor vehicles located in the region.

The on-board computer 20 may also be coupled to an optional physical location detection means capable of instantaneously determining the physical location, heading, and elevation of the on-board computer 20, and hence, the motor vehicle. In the preferred embodiment, the physical location detecting means is a

5 global positioning system (GPS) receiver 30. The GPS receiver 30 is able to immediately establish the monitoring electronic device's global position, (i.e. latitude, longitude, elevation), heading, and velocity.

The GPS is a location system based on a constellation of twenty-four satellites orbiting the Earth at altitudes of approximately 11,000 miles. The GPS satellites
10 provide accurate positioning information twenty-four hours per day, anywhere in the world. The GPS uses a receiver that stores orbit information for all GPS satellites. During use, the receiver determines the time and the positions of the overhead satellites and then calculates the amount of time it takes a GPS radio signal to travel from the satellites to the receiver. By measuring the amount of time it takes for a
15 radio signal to travel from the satellites, the exact location of the GPS receiver can be determined. GPS receivers 30 are available from Corvallis Microtechnology, Inc., in Corvallis, Oregon. It should be understood however, that other means for automatically determining the user's physical location could be used.

In the preferred embodiment, the system 10 uses GPS receivers 30 that are 3-D
20 D coordinate receivers that require a minimum of four visible satellites. It should be understood, however, that the system 10 could be used with 2-D coordinate receivers, which require a minimum of three satellites. The 3-D coordinate receivers are preferred, since they will continue to provide 2-D coordinate information when their views are obstructed by trees, mountains, buildings, etc.

25 A critical component of the system is the client-side software program 28 loaded on each on-board computer 20. The software program 28 collects the information from the translator device 14 and the GPS receiver 30 and transmits it via the wireless modem 35 to the wireless communication network 40. The client-side software program 28 must be able to communicate with the server software program
30 54 located in the central computer 60. When the user initially logs into the system 10, the client-side software program 28 also transmits the user identification information such as the user's name and password.

Another important function of the client-side software program 28 is also used to display a standard interface is then created which displays the translated
35 information to the operator. The interface can then be used to review all of the data stored in the central server 60 thereby providing a complete review of all of the sensors 3-5 used in the motor vehicles under the operator's control. The client-side

5 software program 28 can also be loaded into remote computers to enable the operator to obtain information regarding the motor vehicles. .

As discussed above, the central server 60 is connected to the wide area network 45 and is able to communicate with a plurality of on-board computers 20 also connected to the wide area network 45. It should be understood that the central server
10 60 may be one server or a group of servers all connected to the wide area network 45. Loaded into the memory of the central computer 60 or in the memory of each server is the server-side software program 56 capable of uploading and processing data from the client side software program 28 used with each on-board computer 20 and remote computer 27 as shown in Fig. 2. During use, the central server 60 creates a user
15 information database 63 containing all of the user ID information collected motor vehicle information.

In order to download information from the central server 60, the user must submit a request using the client-side software program 28. In order to use the system
10, the user's or on-board computer's network address must be known to the central
20 server 60 so that information may be downloaded thereto. If the central server 60 is also the authorized user's network service provider to the wide area network 45 and a previously established account has been set up on the central server 60, the numerical or temporary address would be known to the central computer 60 when the user signs onto the central server 60. If the user does not have a previously established account
25 on the central server 60, then the client side software program 28 must be used to collect and transfer the account information to the central server 60 each time the user logs onto the central computer 60.

During use, the user's personal information is entered into the client side software program 28. When initial contact is made with the central server 60, the
30 personal information is automatically downloaded to the central server 60. The client side software program 28 may be a proprietary software program, or may be included as an add-on to an existing INTERNET browser software program. After the account information has been confirmed or set up on the central server 60, the users may begin to download and/or upload information from the central server 60.

35 In compliance with the statute, the invention, described herein, has been described in language more or less specific as to structural features. It should be understood, however, the invention is not limited to the specific features shown, since

5 the means and construction shown comprised only the preferred embodiments for putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the amended claims, appropriately interpreted in accordance with the doctrine of equivalents.

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INDUSTRIAL APPLICABILITY

This invention has application in the wireless communications industry. More specifically, this invention has application in the communications industry that deal with systems for transmitting and displaying multiple motor vehicle information.

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CLAIMS

We claim:

1. A system (10) for transmitting and displaying diagnostic and performance information for motor vehicles having an on-board diagnostic system, said diagnostic system (10) including a plurality of sensors (3 – 5) capable of transmitting codes indicating the status of component on said motor vehicle, said system (10) comprising:
 - b. a translating means capable of translating said codes from said sensors (3 – 5) to a computer readable file;
 - c. a wireless communication means coupled to said translating means capable of communicating with a wireless communication network (40) located around a region;
 - d. a wireless communication network (40) located around a region;
 - e. a computer wide area network (45); and,
 - f. a central computer (60) connected to said wide area network (45), said central computer (60) capable of receiving said translating information from said on-board computers (20) in a region and connected to said wide area network (45) by said wireless communication means (40).
2. The system (10) as recited in Claim 1, further including an on-board computer (20) connected between said translating means and said wireless communication means (40).
3. The system (10) as recited in Claim 1, wherein said translating means is a translator device (14) capable of connecting to said on-board diagnostic system (10) in said motor vehicle.
4. The system (10) as recited in Claim 3, wherein said translating means translates said codes into ASCII files.
5. The system (10) as recited in Claim 2, further including a physical location detecting means (30) coupled to each said on-board computer (20), said physical

5 location detecting means (30) capable of determining the physical location of said on-board computer (20);

6. The system (10), as recited in Claim 6, wherein said physical location detecting means (30) is a GPS receiver used in a GPS network.

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7. The system (10), as recited in Claim 6, wherein said wireless communication means is a wireless modem (35) capable of communicating with said wireless communication network (40).

15 8. The system (10), as recited in Claim 2, further including a client-side software program (28) loaded into each said on-board computer (20) and a server side software program (56) loaded into said central server to enable said on-board computer to communicate with said central server (60).

20 9. A system (10) for transmitting and displaying diagnostic and performance information for motor vehicles having an on-board diagnostic system, said on-board diagnostic system including a plurality of sensors capable of transmitting codes indicating the status of components on said motor vehicle, said system (10) comprising:

25 a. a translating device located in each motor vehicle capable of being coupled to said sensors and capable of translating said codes from said sensors to a computer readable file;

b. an on-board computer (20) connected to said translating device;

30 c. a wireless communication means coupled to said translating means capable of communicating with a wireless communication network (40) located around a region;

d. a wireless communication network (40) located around a region;

e. a computer wide area network (45); and,

35 f. a central computer (60) connected to said wide area network (45), said central computer (60) capable of receiving said translating information from said on-board computers (20) in a region and connected to said wide area network (45) by said wireless communication means.

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10. The system (10) as recited in Claim 9, wherein said translating means translates said codes into ASCII files.

11. The system (10) as recited in Claim 9, further including a physical location
10 detecting means (30) coupled to each said on-board computer (20), said physical
location detecting means (30) capable of determining the physical location of said on-
board computer (20);

12. The system (10), as recited in Claim 11, wherein said physical location
15 detecting means (30) is a GPS receiver used in a GPS network.

13. The system (10), as recited in Claim 9, wherein said wireless communication
means is a wireless modem (35) capable of communicating with said wireless
communication network (40).

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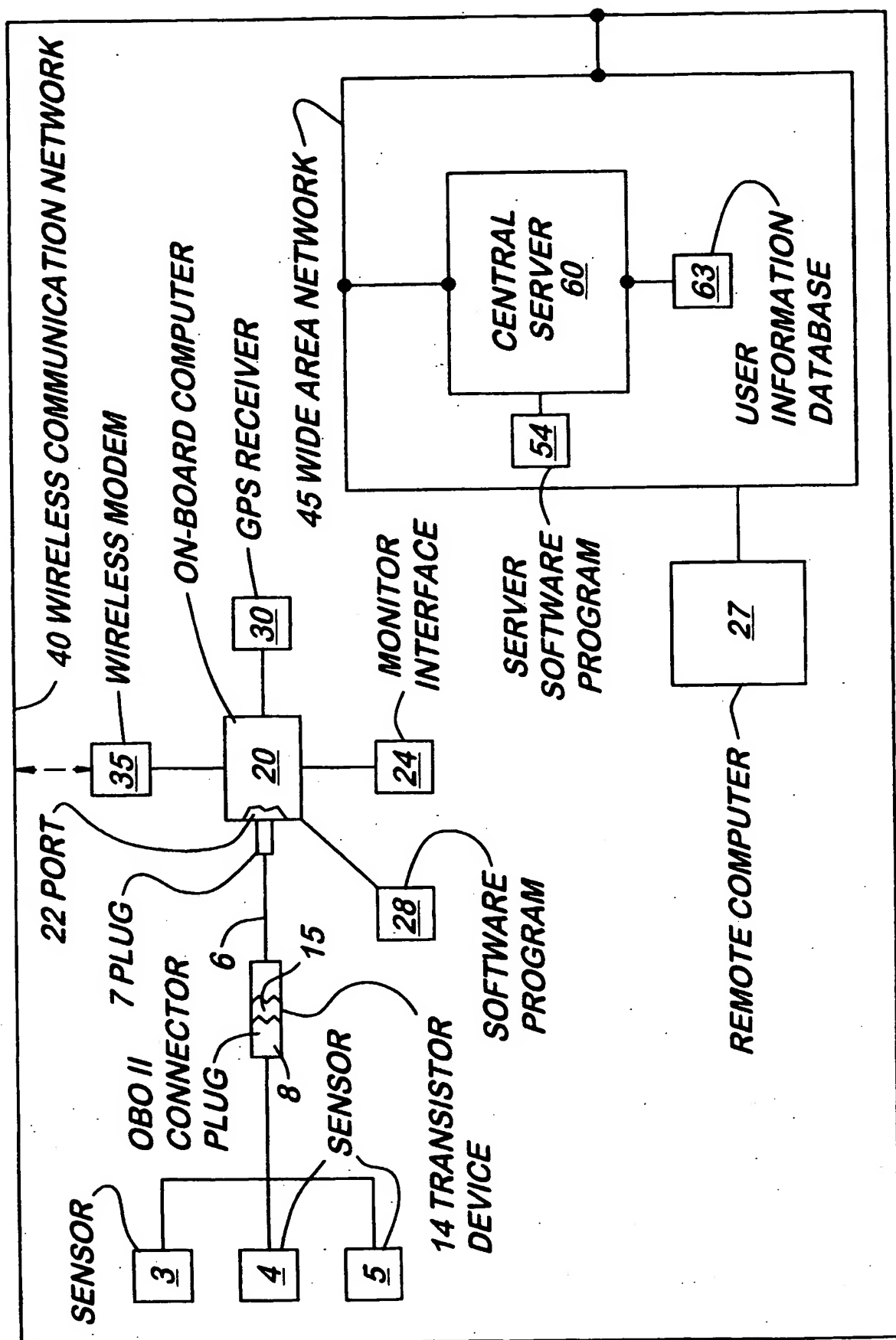


FIG. 1

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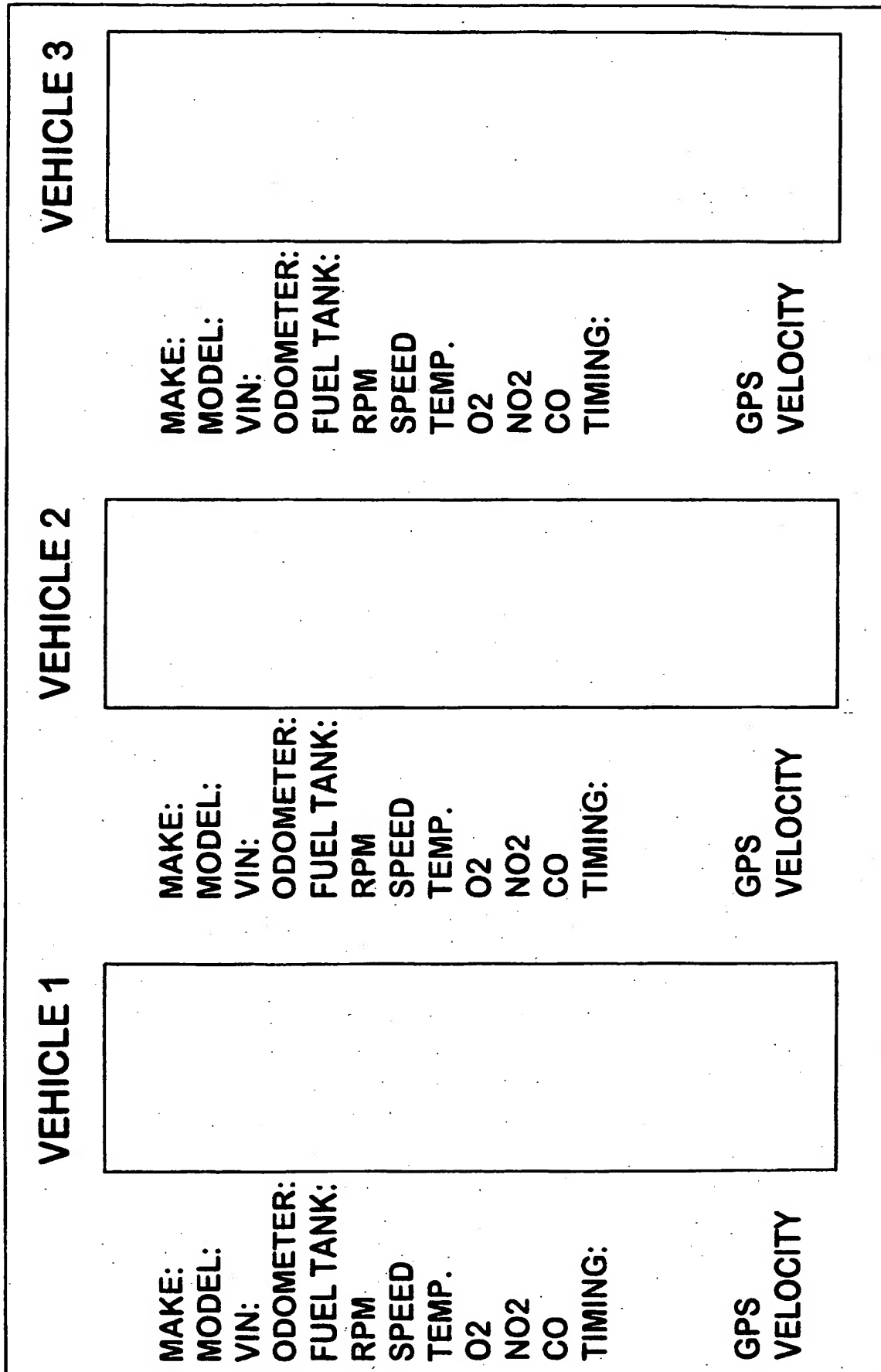


FIG. 2

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/02546

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G01M 15/00

US CL : 701/33

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 701/33, 36, 200, 213, 24, 35, 1; 340/438,425.5,459,286.02,286.01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,884,202 A (Arjomand) 16 March 1999 (16.03.1999), see entire document.	1-2
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Y		9
Y, I'	US 6,141,611 A (Mackey et al.) 31 October 2000 (31.10.2000), see complete document	6,7,13

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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